Claims

Please amend the claims as follows:

1. (Currently Amended) A method for generating a projection of a received signal ~~(y)~~, said received signal comprising H, a signal of ~~the~~ a source of interest; S, the signals of all other sources and multi-path versions of the source of interest and composed of vectors $s_1, s_2, s_3 ..., s_p$; and noise (n); the method comprising the steps of:

determining a basis matrix U composed of basis vectors $u_1, u_2, ... u_p$;

storing elements of said basis matrix U; ~~and~~

~~determining y_{perp} where:~~

$$\cancel{y_{perp} = y - U(U^T U)^{-1} U^T y}$$

generating a diagonal matrix from stored said elements of the basis matrix U;

generating one or more scalars from the diagonal matrix and from the basis vectors of the basis matrix U; and

applying the one or more scalars to the received signal to project the signal of the source of interest.

2. (Currently Amended) The method recited in claim 1, ~~wherein said step of~~ further comprising the step of computing the basis vectors, wherein computing the basis vectors comprises the steps of:

A. assigning s_1 as a first vector of basis matrix U;

B. decomposing s_2 into a component which is in said basis matrix U and a component that is not (u_2); and

C. redefining the basis matrix U to incorporate basis vector u_2.

3. (Currently Amended) The method recited in claim 2, wherein said step of computing the basis vectors further comprises the steps of:

repeating steps B and C for each vector of S.

4. (Currently Amended) The method recited in claim 2, wherein said step of computing the basis vectors further comprises the steps of:

comparing u_i to a predetermined threshold and if u_i is greater than said threshold, adding u_i to the basis and repeating steps B and C for each vector of S, else ignoring the u_i and continuing to repeat steps B and C.

5. (Currently Amended) The method recited in claim 2, wherein said step of computing the basis vectors further comprises the steps of:

computing $1/\sigma_i$, where $\mathbf{u}_i^{\mathrm{T}}\mathbf{u}_i = \sigma_i$; and

storing u_i and $1/\sigma_i$

6. (Currently Amended) The method recited in claim 2, wherein said step of computing the basis vectors further comprises the steps of:

computing $\mathbf{u}_i = \mathbf{s}_i - \mathbf{u}_1 \frac{1}{\sigma_1} \mathbf{u}_1^{\mathrm{T}} \mathbf{s}_i - \mathbf{u}_2 \frac{1}{\sigma_2} \mathbf{u}_2^{\mathrm{T}} \mathbf{s}_i - \ldots\ldots - \mathbf{u}_{i-1} \frac{1}{\sigma_{i-1}} \mathbf{u}_{i-1}^{\mathrm{T}} \mathbf{s}_i$;

storing u_i and $1/\sigma_i$, wherein $\mathbf{u}_i^{\mathrm{T}}\mathbf{u}_i = \sigma_i$; and

repeating said computing and storing steps if u_i is above a predetermined threshold, else ignoring this particular u_i.

7. (Currently Amended) The method recited in claim 1, wherein said step of ~~determining y_{perp}~~ applying comprises the step of calculating y_{perp} with the following formula:

$$\mathbf{y}_{\mathrm{perp}} = \mathbf{y} - \mathbf{U} \begin{bmatrix} \frac{1}{\sigma_1} & 0 & . & . & 0 \\ 0 & \frac{1}{\sigma_2} & . & . & 0 \\ . & . & . & . & . \\ . & . & . & . & . \\ 0 & 0 & . & . & \frac{1}{\sigma_p} \end{bmatrix} \mathbf{U}^{\mathrm{T}} \mathbf{y},$$

wherein $\mathbf{y}_{\mathbf{perp}}$ is a projected said received signal y, $\sigma_i = \mathbf{u}_i^{\mathbf{T}}\mathbf{u}_i$, and $\mathbf{u}_i$ is a basis vector of U.

8. (Currently Amended) The method recited in claim ~~1~~7, wherein said step of ~~determining~~ calculating y_{perp} comprises the step of calculating y_{perp} with the following formula:

$$\mathbf{y}_{\mathbf{perp}} = \mathbf{y} - \mathbf{u}_1 \frac{1}{\sigma_1}\mathbf{u}_1^{\mathbf{T}}\mathbf{y} - \mathbf{u}_2 \frac{1}{\sigma_2}\mathbf{u}_2^{\mathbf{T}}\mathbf{y} - \ldots\ldots \mathbf{u}_{p-1}\frac{1}{\sigma_{p-1}}\mathbf{u}_{p-1}^{\mathbf{T}}\mathbf{y} - \mathbf{u}_p \frac{1}{\sigma_p}\mathbf{u}_p^{\mathbf{T}}\mathbf{y}.$$

9. (Currently Amended) The method recited in claim ~~1~~8, further comprising the step of determining y_s ~~where:~~

$$\cancel{\mathbf{y}_s = \mathbf{U}(\mathbf{U}^{\mathbf{T}}\mathbf{U})^{-1}\mathbf{U}^{\mathbf{T}}\mathbf{y}.}$$

$$\mathbf{y}_s = \mathbf{u}_1 \frac{1}{\sigma_1}\mathbf{u}_1^{\mathbf{T}}\mathbf{y} - \mathbf{u}_2 \frac{1}{\sigma_2}\mathbf{u}_2^{\mathbf{T}}\mathbf{y} - \ldots\ldots \mathbf{u}_{p-1}\frac{1}{\sigma_{p-1}}\mathbf{u}_{p-1}^{\mathbf{T}}\mathbf{y} - \mathbf{u}_p \frac{1}{\sigma_p}\mathbf{u}_p^{\mathbf{T}}\mathbf{y},$$

wherein y_s is a projected said signal of the source of interest.

[[.]]

10. (Currently Amended) A method for generating a projection ~~from~~ of a received signal ~~(~~y~~)~~, said received signal comprising H, a spread signal matrix of ~~the~~ a source of interest; S, the spread signal matrix of all other sources of interest and composed of vectors $\mathbf{s}_1, \mathbf{s}_2, \mathbf{s}_3 \ldots, \mathbf{s}_p$; and noise ~~(~~n~~)~~; the method comprising the steps of:

forming an orthogonal basis U of the matrix S, comprising:

A. assigning s_1 as a first basis vector u_1[[;]],

B. determining σ_i, where $\mathbf{u}_i^{\mathbf{T}}\mathbf{u}_i = \sigma_i$ [[; and]],

C. storing u_i[[;]],

D. computing of inner products of the s_{i+1} and the u_1 through u_i vectors[[;]],

E. multiplying said inner product with a respective scalar $1/\sigma_i$ and thereby creating a first intermediate product,

F. scaling each respective basis vector u_i by multiplying each respective first intermediate product with each respective basis vector u_i[[;]],

G. obtaining a vector sum from step F[[;]].

H. subtracting said vector sum from s_{i+1} to obtain the next basis vector u_{i+1}[[;]].

I. comparing u_{i+1} to a predetermined value and if equal to or less than said value, discarding the u_{i+1} and going to step N[[;]].

J. storing u_{i+1}[[;]].

K. determining an inner product of $u^T_{i+1}u_{i+1}$[[;]].

L. determining the reciprocal of step K which is $1/\sigma_{i+1}$[[;]].

M. storing $1/\sigma_{i+1}$[[;]].

N. incrementing i[[;]]. and

O. conducting steps D through N until i=p, where p is the total number of said sources of interest;

~~P. determining y_{perp} where:~~

$\cancel{y_{perp} = y - U(U^TU)^{-1}U^Ty}$

generating a diagonal matrix from stored $1/\sigma_{i+1}$ values;

generating one or more scalars from the diagonal matrix and from the basis vectors of the orthogonal basis U; and

applying the one or more scalars to the received signal to project the source of interest.

11. (Original) The method recited in claim 10, wherein said computing step (D) is conducted in series.

12. (Original) The method recited in claim 10, wherein said computing step (D) is conducted in parallel.

13. (Original) The method recited in claim 10, wherein said multiplying step (E) is conducted in series.

14. (Original) The method recited in claim 10, wherein said multiplying step (E) is conducted in parallel.

15. (Original) The method recited in claim 10, wherein said scaling step (F) is conducted in series.

16. (Original) The method recited in claim 10, wherein said scaling step (F) is conducted in parallel.

17. (Original) The method recited in claim 10, wherein said storing step (C) also stores σ_i.

18. (Original) The method recited in claim 10, wherein said storing step (C) also stores $1/\sigma_i$.

19. (Original) The method recited in claim 10, wherein said inner product step (K) is conducted in series.

20. (Original) The method recited in claim 10, wherein said inner product step (K) is conducted in parallel.

21. (Currently Amended) A method for generating a projection ~~from~~ <u>of</u> a received signal ~~(y)~~, said <u>received</u> signal comprising H, a spread signal matrix of ~~the~~ <u>a</u> source of interest; S, the spread signal matrix of all other sources of interest and composed of vectors $\mathbf{s}_1, \mathbf{s}_2, \mathbf{s}_3 ..., \mathbf{s}_p$; and noise ($\mathbf{n}$); the method comprising the steps of:

<u>forming an orthogonal basis U of the matrix S, comprising:</u>

A. assigning s_1 as a first basis vector u_1[[;]]<u>,</u>

B. determining σ_i, where $\mathbf{u}_i^T \mathbf{u}_i = \sigma_i$ [[; and]]<u>,</u>

C. storing u_i[[;]]<u>,</u>

D. computing of inner products of the s_{i+1} and the u_1 through u_i vectors[[;]]<u>,</u>

E. multiplying said inner product with a respective scalar $1/\sigma_i$ and thereby creating a first intermediate product[[;]],

F. scaling each respective basis vector u_i by multiplying each respective first intermediate product with each respective basis vector u_i[[;]],

G. serially subtracting said intermediate product from s_{i+1}[[;]],

H. utilizing the result from step G and subtracting the next incoming value of $\mathbf{u}_i \frac{1}{\sigma_i} \mathbf{u}_i^T \mathbf{s}_{i+1}$ until all the values are processed[[;]],

I. obtaining the next basis vector u_{i+1} from step H[[;]],

J. comparing u_{i+1} to a predetermined value and if equal to or less than said value, discarding u_{i+1} and going to step O[[;]],

K. storing u_{i+1}[[;]],

L. determining an inner product of $u^T_{i+1}u_{i+1}$[[;]],

M. determining the reciprocal of step K which is $1/\sigma_{i+1}$[[;]],

N. storing $1/\sigma_{i+1}$[[;]],

O. incrementing i[[;]], and

P. conducting steps D through O until i=p, where p is the total number of said sources of interest;

~~Q. determining y_{perp} where:~~

$$\cancel{\mathbf{y}_{perp} = \mathbf{y} - \mathbf{U}(\mathbf{U}^T\mathbf{U})^{-1}\mathbf{U}^T\mathbf{y}.}$$

generating a diagonal matrix from stored $1/\sigma_{i+1}$ values;

generating one or more scalars from the diagonal matrix and from the basis vectors of the orthogonal basis U; and

applying the one or more scalars to the received signal to project the source of interest.

22. (Original) The method recited in claim 21, wherein said computing step (D) is conducted in series.

23. (Original) The method recited in claim 21, wherein said computing step (D) is conducted in parallel.

24. (Original) The method recited in claim 21, wherein said multiplying step (E) is conducted in series.

25. (Original) The method recited in claim 21, wherein said multiplying step (E) is conducted in parallel.

26. (Original) The method recited in claim 21, wherein said scaling step (F) is conducted in series.

27. (Original) The method recited in claim 21, wherein said scaling step (F) is conducted in parallel.

28. (Original) The method recited in claim 21, wherein said storing step (C) also stores σ_i.

29. (Original) The method recited in claim 21, wherein said storing step (C) also stores $1/\sigma_i$.

30. (Original) The method recited in claim 21, wherein said inner product step (L) is conducted in series.

31. (Original) The method recited in claim 21, wherein said inner product step (L) is conducted in parallel.

32. (Currently Amended) An apparatus for generating a projection ~~from~~ of a received signal ~~(y)~~, said received signal comprising H, a signal of ~~the~~ a source of interest; S, the signals of all other sources and composed of vectors $\mathbf{s}_1, \mathbf{s}_2, \mathbf{s}_3 ..., \mathbf{s}_p$; and noise (n); the apparatus comprising:

means for determining a basis vector U;

means for storing elements of said basis vector U; ~~and~~

~~means determining y_{perp} where: $\mathbf{y}_{perp} = \mathbf{y} - \mathbf{U}(\mathbf{U}^T\mathbf{U})^{-1}\mathbf{U}^T\mathbf{y}$~~

means for generating a diagonal matrix from stored said elements of the basis vector U;

means for generating one or more scalars from the diagonal matrix and from the basis vector U; and

means for applying the one or more scalars to the received signal to project the signal of the source of interest.

33. (Currently Amended) An apparatus for generating a projection ~~from~~ of a received signal ~~(y)~~, said received signal comprising H, a spread signal matrix of ~~the~~ a source of interest; S, the spread signal matrix of all other sources of interest and composed of vectors $\mathbf{s}_1, \mathbf{s}_2, \mathbf{s}_3 ..., \mathbf{s}_p$; and noise (n); the apparatus comprising:

means for forming an orthogonal basis U of the matrix S, comprising:

A. means for assigning s_1 as a first basis vector u_1[[;]],

B. means for determining σ_i, where $\mathbf{u}_i^T \mathbf{u}_i = \sigma_i$ [[; and]],

C. means for storing u_i[[;]],

D. means for computing of inner products of the s_{i+1} and the u_1 through u_i vectors[[;]],

E. means for multiplying said inner product with a respective scalar $1/\sigma_i$ and thereby creating a first intermediate product[[;]],

F. means for scaling each respective basis vector u_i by multiplying each respective first intermediate product with each respective basis vector u_i[[;]],

G. means for obtaining a vector sum from step F[[;]],

H. means for subtracting said vector sum from s_{i+1} to obtain the next basis vector u_{i+1}[[;]],

I. means for comparing u_{i+1} to a predetermined value and if equal to or less than said value, discarding this u_{i+1} and going to step N[[.]],

J. means for storing u_{i+1}[[;]],

K. means for determining an inner product of $u^T_{i+1}u_{i+1}$[[;]],

L. means for determining the reciprocal of step K which is $1/\sigma_{i+1}$[[;]],

M. means for storing $1/\sigma_{i+1}$[[;]],

N. means for incrementing i[[;]],

O. means for conducting steps D through N until i=p, where p is the total number of said sources of interest;

~~P. means for determining~~ $\cancel{y_{perp}}$ ~~where:~~ $\cancel{y_{perp} = y - U(U^TU)^{-1}U^Ty}$

means for generating a diagonal matrix from stored $1/\sigma_{i+1}$ values;

means for generating one or more scalars from the diagonal matrix and from the basis vectors of the orthogonal basis U; and

means for applying the one or more scalars to the received signal to project the source of interest.

34. (Currently Amended) An apparatus for generating a projection from a received signal ~~(y)~~, said received signal comprising H, a spread signal matrix of ~~the~~ a source of interest; S, the spread signal matrix of all other sources of interest and composed of vectors $\mathbf{s}_1, \mathbf{s}_2, \mathbf{s}_3 ..., \mathbf{s}_p$; and noise (n); the apparatus comprising:

means for forming an orthogonal basis U of the matrix S, comprising:

A. means for assigning s_1 as a first basis vector u_1[[;]],

B. means for determining σ_i, where $\mathbf{u}_i^T\mathbf{u}_i = \sigma_i$ [[;]], ~~and~~

C. means for storing u_i[[;]],

D. means for computing of inner products of the s_{i+1} and the u_1 through u_i vectors[[;]],

E. means for multiplying said inner product with a respective scalar $1/\sigma_i$ and thereby creating a first intermediate product[[;]],

F. means for scaling each respective basis vector u_i by multiplying each respective first intermediate product with each respective basis vector u_i[[;]],

G. means for serially subtracting said intermediate product from s_{i+1}[[;]],

H. means for utilizing the result from step G and subtracting the next incoming value of $\mathbf{u}_i \frac{1}{\sigma_i} \mathbf{u}_i^T \mathbf{s}_{i+1}$ until all the values are processed[[;]],

I. means for obtaining the next basis vector u_{i+1} from step H[[;]],

J. means for comparing u_{i+1} to a predetermined value and if equal to or less than said value, going to step O[[;]],

K. means for storing u_{i+1}[[;]],

L. means for determining an inner product of $u^T_{i+1}u_{i+1}$[[;]],

M. means for determining the reciprocal of step K which is $1/\sigma_{i+1}$[[;]],

N. means for storing $1/\sigma_{i+1}$[[;]],

O. means for incrementing i[[;]],

P. means for conducting steps D through O until i=p, where p is the total number of said sources of interest; ~~and~~

~~Q. means for determining y_{perp} where: $y_{perp} = y - U(U^TU)^{-1}U^Ty$~~

<u>means for generating a diagonal matrix from stored $1/\sigma_{i+1}$ values;</u>

<u>means for generating one or more scalars from the diagonal matrix and from the basis vectors of the orthogonal basis U; and</u>

<u>means for applying the one or more scalars to the received signal to project the source of interest</u>.

35. (Currently Amended) A method for generating a projection of a received signal ~~(y)~~, said <u>received</u> signal comprising H, a signal of ~~the~~ <u>a</u> source of interest; S, the signals of all other sources and multi-path versions of the source of interest and composed of vectors $\mathbf{s}_1, \mathbf{s}_2, \mathbf{s}_3 ..., \mathbf{s}_p$; and noise (n); the method comprising the steps of:

determining a basis matrix U composed of basis vectors $u_1, u_2, \ldots u_p$;

storing elements of said basis matrix U;

~~determining y_{perp} where:~~

~~$y_{perp} = y - U(U^TU)^{-1}U^Ty$; and~~

~~determining y_s where:~~

~~$\mathbf{y}_s = \mathbf{U}(\mathbf{U}^{\mathrm{T}}\mathbf{U})^{-1}\mathbf{U}^{\mathrm{T}}\mathbf{y}.$~~

generating a diagonal matrix from stored said elements of the basis matrix U;

generating one or more scalars from the diagonal matrix and from the basis vectors of the basis matrix U;

applying the one or more scalars to the received signal to project the signal of the source of interest; and

determining $\mathbf{y}_s = \mathbf{u}_1 \frac{1}{\sigma_1} \mathbf{u}_1{}^{\mathrm{T}} \mathbf{y} - \mathbf{u}_2 \frac{1}{\sigma_2} \mathbf{u}_2{}^{\mathrm{T}} \mathbf{y} - \ldots\ldots \mathbf{u}_{p-1} \frac{1}{\sigma_{p-1}} \mathbf{u}^{\mathrm{T}}_{p-1} \mathbf{y} - \mathbf{u}_p \frac{1}{\sigma_p} \mathbf{u}^{\mathrm{T}}_p \mathbf{y},$

wherein y_S is a projected said signal of the source of interest.

36. (Currently Amended) The method recited in claim 10, further comprising the step of determining ~~y_S where:~~

~~$\mathbf{y}_s = \mathbf{U}(\mathbf{U}^{\mathrm{T}}\mathbf{U})^{-1}\mathbf{U}^{\mathrm{T}}\mathbf{y}$~~

$$\mathbf{y}_s = \mathbf{u}_1 \frac{1}{\sigma_1} \mathbf{u}_1{}^{\mathrm{T}} \mathbf{y} - \mathbf{u}_2 \frac{1}{\sigma_2} \mathbf{u}_2{}^{\mathrm{T}} \mathbf{y} - \ldots\ldots \mathbf{u}_{p-1} \frac{1}{\sigma_{p-1}} \mathbf{u}^{\mathrm{T}}_{p-1} \mathbf{y} - \mathbf{u}_p \frac{1}{\sigma_p} \mathbf{u}^{\mathrm{T}}_p \mathbf{y},$$

wherein y_S is a projected said source of interest.

37. (Currently Amended) The method recited in claim 21, further comprising the step of determining ~~y_S where:~~

~~$\mathbf{y}_s = \mathbf{U}(\mathbf{U}^{\mathrm{T}}\mathbf{U})^{-1}\mathbf{U}^{\mathrm{T}}\mathbf{y}$~~

$$\mathbf{y}_s = \mathbf{u}_1 \frac{1}{\sigma_1} \mathbf{u}_1{}^{\mathrm{T}} \mathbf{y} - \mathbf{u}_2 \frac{1}{\sigma_2} \mathbf{u}_2{}^{\mathrm{T}} \mathbf{y} - \ldots\ldots \mathbf{u}_{p-1} \frac{1}{\sigma_{p-1}} \mathbf{u}^{\mathrm{T}}_{p-1} \mathbf{y} - \mathbf{u}_p \frac{1}{\sigma_p} \mathbf{u}^{\mathrm{T}}_p \mathbf{y},$$

wherein y_S is a projected said source of interest.

38. (Currently Amended) An apparatus for generating a projection from a received signal ~~(y)~~, said received signal comprising H, a signal of ~~the~~ a source of interest; S, the signals of all other sources and composed of vectors $\mathbf{s}_1, \mathbf{s}_2, \mathbf{s}_3 \ldots, \mathbf{s}_p$; and noise (n); the apparatus comprising:

means for determining a basis vector U;

means for storing elements of said basis vector U;

~~means for determining y_{perp} where: $\mathbf{y}_{perp} = \mathbf{y} - \mathbf{U}(\mathbf{U}^T\mathbf{U})^{-1}\mathbf{U}^T\mathbf{y}$.~~

~~means for determining y_s where:~~

~~$\mathbf{y}_s = \mathbf{U}(\mathbf{U}^T\mathbf{U})^{-1}\mathbf{U}^T\mathbf{y}$~~

means for generating a diagonal matrix from stored said elements of the basis vector U;

means for generating one or more scalars from the diagonal matrix and from the basis vector U;

means for applying the one or more scalars to the received signal to project the signal of the source of interest; and

means for determining $\mathbf{y}_s = \mathbf{u}_1 \frac{1}{\sigma_1} \mathbf{u}_1^T \mathbf{y} - \mathbf{u}_2 \frac{1}{\sigma_2} \mathbf{u}_2^T \mathbf{y} - \ldots\ldots \mathbf{u}_{p-1} \frac{1}{\sigma_{p-1}} \mathbf{u}_{p-1}^T \mathbf{y} - \mathbf{u}_p \frac{1}{\sigma_p} \mathbf{u}_p^T \mathbf{y}$,

wherein y_S is a projected said signal of the source of interest.

39. (New) A system, comprising:

means for generating a first matrix from a received signal, wherein the received signal comprises a plurality of signals;

means for generating a second matrix from the first matrix, wherein the second matrix is a substantially orthogonal basis of the first matrix;

means for storing values used in generating the second matrix;

means for generating a diagonal matrix from stored said values;

means for generating one or more scalars from the diagonal matrix and from the second matrix; and

means for multiplying the one or more scalars to the received signal to project the received signal substantially orthogonal to said plurality of signals.

40. (New) A method, comprising:

generating a first matrix from a received signal, wherein the received signal comprises a plurality of signals;

generating a second matrix from the first matrix, wherein the second matrix is a substantially orthogonal basis of the first matrix;

storing values used in generating the second matrix;

generating a diagonal matrix from stored said values;

generating one or more scalars from the diagonal matrix and from the second matrix; and

multiplying the one or more scalars to the received signal to project the received signal substantially orthogonal to said plurality of signals.